Jameco Part number 143811

MINI-MODS

Miniature Engineering Modules

RAMPack B

Photo Not Yet Available

PRELIMINARY

Description

The RAMPack B module maintains 8Kx8 bytes of RAM. The module makes use of buffers and an on board microcontroller in order to allow addressable access to the RAM using only two i/o lines.

An automatic baud rate detection scheme allows the user to use a variety of baud rates without setting hardware jumpers. The RAMPack B supports 1200, 2400, 4800, 9600, and 19200 baud rates.

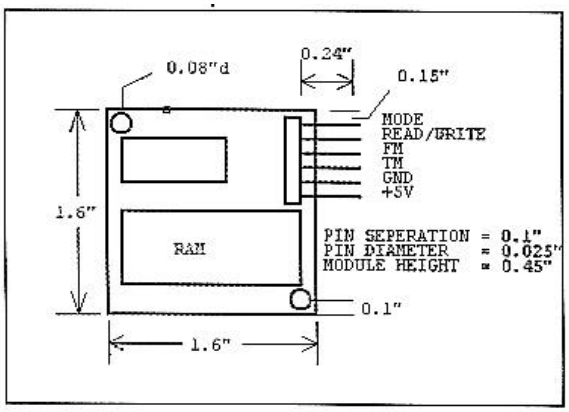
The 8Kx8 bytes of low cost static RAM comes socketed. If the user requires non-volatile RAM(RAM whose data stays valid after power is removed), a higher priced NVRAM can be purchased and inserted into the socket. A software command allows the RAMPack B to be expanded to handle 32Kx8 RAM.

An additional buffer mode has been implemented in the RAMPack B. It is a FIFO(first-in-first-out) buffer. Bytes of data may be sent to the device and each byte will be stored sequentially in RAM. Initiating a read in FIFO mode will cause the RAMPack B to send all of the stored data to the Master device. No commands or addressing are required to store data with FIFO mode. This mode does require a 4 pin interface to access it's functions.

Pin Descriptions

MODE	Has weak pull up resistor(100k ohm). Set or unconnected for normal operation. Pulled low for FIFO mode.
READ/WRITE	Has weak pull up resistor(100k ohm). Only used in FIFO mode. Set for a buffer READ. Clear for buffer WRITE.
FM	Data received from Master on this pin.
TM	Data sent to master on this pin.
GND	Ground potential, grounds are common.
+5V	Supply for control circuitry.

Mechanical Specifications



Operational Ratings

Operating Temperature:	0°C to 70°C
Storage Temperature:	-45°C to 85°C
Minimum Operational Voltage:	5.0V.
Maximum Operational Voltage:	7.0V
Voltage on Any Header Pin:	-0.3V to 7.0V
Maximum Current Sunk by TM/FM pin:	25mA
Maximum Current Sourced TM pin:	5mA
Average DC operational current:	10mA
Data Rates:	1.2, 2.4, 4.8, 9.6, 19.2 kbaud
Sync Byte:	hex55, binary"0101 0101"
Write Command:	hex00, binary"0000 0000"
Byte Read Command:	hex01, binary"0000 0001"
Block Read Command:	hex02, binary"0000 0010"
Expand RAM	hex03, binary"0000 0011"
FIFO Baud	hex04, binary"0000 0100"
Address Range:	hex0000-hex1FFF - normal hex0000-hex7FFF - expanded

SOLUTIONS CUBED

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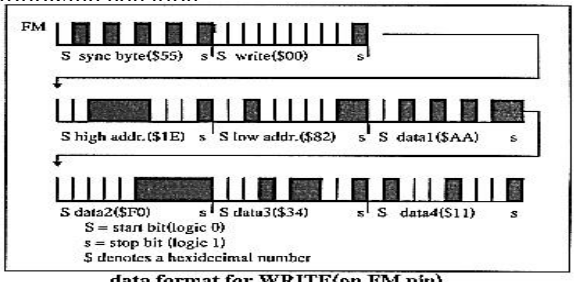
Communication Protocols

NOTE- When not in FIFO mode keep the MODE pin high or not connected. Weak pull up resistors are included on the MODE and READ/WRITE pins. The MODE and READ/WRITE pins are only used in FIFO mode.

WRITE-

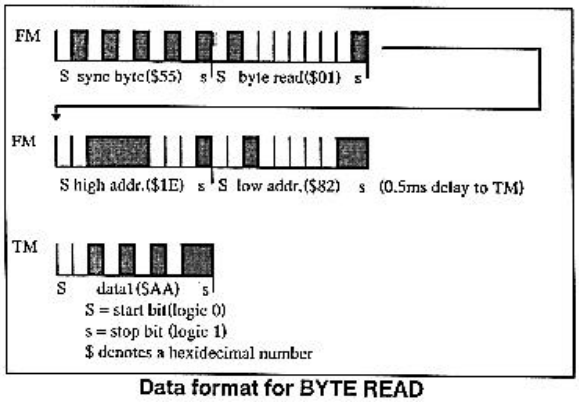
The following timing diagram details the method for writing four bytes(data 1-data4)to RAM, starting at address hex1E82. You must send a start bit followed by the 8 data bits and a stop bit for each byte. Data is sent to the RAMPack B on the FM pin(From Master). The RAMPack B will determine the baud rate to use from the sync byte(unless in buffer mode). The first byte sent is the sync byte(hex55); which is followed by the write command(hex00). The next two bytes are the high and low address bytes. This address is hex1E82, see the memory map for available locations. Make sure that you address only locations that actually exist(don't write to hex7FFF). After the address bytes are sent, the data bytes follow. Data1 will be written to location hex1E82. Data2 will be written to hex1E83, data3 to hex1E84, and data4 to hex1E85.

A WRITE command ends when the FM line has been high for a time period greater than 5 byte lengths. This can be easily done with a delay loop or pause routine. To calculate this delay use the following equation


FM
S sync byte($55) s S write($00) s
S high addr.($1E) s S low addr.($82) s S data1($AA) s
S data2($F0) s S data3($34) s S data4($11) s
S = start bit(logic 0)
s = stop bit (logic 1)
$ denotes a hexidecimal number

data format for WRITE(on FM pin)

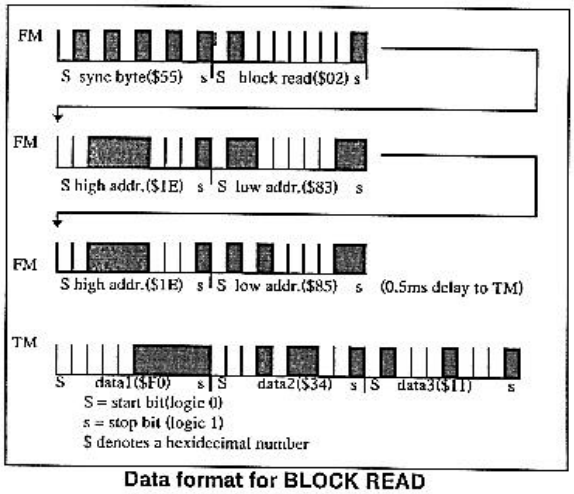
command(hex01). The next two bytes are the high and low address bytes. This address is hex1E83. After the address bytes are received by the RAMPack waits for about 0.5ms. When this period elapses the data byte will be sent LSB first on the TM(To Master)pin. Data will be read from location hex1E82.


FM
S sync byte($55) s S byte read($01) s
FM
S high addr.($1E) s S low addr.($82) s (0.5ms delay to TM)
TM
S data1($AA) s
S = start bit(logic 0)
s = stop bit (logic 1)
$ denotes a hexidecimal number

Data format for BYTE READ

BLOCK READ-

The following timing diagram details the method for reading three bytes from RAM, starting at address hex1E83. The sync through address bytes are sent on the FM pin. The first byte sent is the sync byte(hex55); which is followed by the read command(hex02). The next two bytes are the high and low address bytes that the blcok read will start at. This address is hex1E83. The next two bytes are the address bytes that point to the end of the block read, or hex1E85. After the address bytes are received the RAMPack waits for about 0.5ms. When this period elapses the data bytes will be sent LSB first on the TM(To Master)pin. Data1 will be read from location hex1E83, data2 will be read from hex1E84, and data3 from hex1E85. Data sent on the TM pin is sent 8N1, as described above. The baud rate of data on the TM pin is the same as the rate of data on the FM pin when the read command was received.


FM
S sync byte($55) s S block read($02) s
FM
S high addr.($1E) s S low addr.($83) s
FM
S high addr.($1E) s S low addr.($85) s (0.5ms delay to TM)
TM
S data1($F0) s S data2($34) s S data3($11) s
S = start bit(logic 0)
s = stop bit (logic 1)
$ denotes a hexidecimal number

Data format for BLOCK READ

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This routine uses the "write" and "block read" commands to write data to RAM. The lower byte address of the write and read is randomized with every pass. The sync byte is used to determine the baud rate of communication.

```
INPUT       15
OUTPUT      14
OUTPUT      13
OUTPUT      12
VALUE       VAR     BYTE
```

Initial values of variable registers

```
VALUE       = $00
b4          = $32
b5          = $00
b15         = $0A
```

START:

```
HIGH        14      set FM pin
HIGH        13      set read/write pin
HIGH        12      set mode pin to normal mode
PAUSE       3000
```

MORE STUFF:

```
B6 = b4 + 8
                    WRITE (H'00') data at 9600 baud starting at H'10XX'
SEROUT      14,84,[$55,$00,$10,b4,VALUE,$01,$02,$03,$04,$05,$06,$07,VALUE]

PAUSE       2
                    Send BLOCK READ command. Read data from B4 to B4+8
                    or 9 bytes of data
SEROUT      14,84,[$55,$02,$10,b4,$10,b6]
                    read and store data
SERIN       15,84,100,NOISE2, [b15,b14,b13,b12,b11,b10,b9,b8,b7]
```

DISPLAY:

```
                      display data
DEBUG   ISHEX2  b15,CR
DEBUG   ISHEX2  b14,TAB
DEBUG   ISHEX2  b13,TAB
DEBUG   ISHEX2  b12,TAB
DEBUG   ISHEX2  b11,CR
DEBUG   ISHEX2  b10,TAB
DEBUG   ISHEX2  b9,TAB
DEBUG   ISHEX2  b8,TAB
DEBUG   ISHEX2  b7,CR,CR
```

test if data written = data read

```
if VALUE <> b15 then NOISE
if b14 <> $01 then NOISE
if b13 <> $02 then NOISE
if b12 <> $03 then NOISE
if b11 <> $04 then NOISE
if b10 <> $05 then NOISE
if b9 <> $06 then NOISE
if b8 <> $07 then NOISE
if VALUE <> b7 then NOISE
VALUE = VALUE +1
```

```
Jameco Part number 143811
MIX_IT:
RANDOM W2

                randomize lower byte of address
    IF b4 > $F7 THEN MIX_IT
    GOTO MORE_STUFF

NOISE:
DEBUG           BELL
DEBUG           ISHEX2 b4,TAB
DEBUG           ISHEX2 b6,TAB
DEBUG           ISHEX2 VALUE,CR
GOTO            DONE

NOISE2:
DEBUG           BELL
DEBUG           BELL

DONE:
END:
```

Jameco Part number 143811
This routine writes a byte of data to a random address in RAM at 1200 baud. If the byte written is equal to the byte read back from the same address then the address and data are displayed. If data is not correct then the bell is sounded.

```
INPUT       15
OUTPUT      14
OUTPUT      13
OUTPUT      12
VALUE       VAR         BYTE

Initial values of variable registers

VALUE           = $AA
B4              = $EF
B5              = $10
B15             = $00

START:
HIGH            14
HIGH            13
HIGH            12
PAUSE           3000

MORE_STUFF:
SEROUT          14, 813, [$55, $00, b5, b4, VALUE]

PAUSE           50

SEROUT          14, 813, [$55, $01, b5, b4]
SERIN           15, 813, 1000, NOISE2, [b15]

DISPLAY:
    DEBUG  ISHEX2 b5, TAB
    DEBUG  ISHEX2 b4, TAB
    DEBUG  ISHEX2 VALUE, CR, CR
    if VALUE <> b15 then NOISE
    VALUE = VALUE +1

MIX_IT:
RANDOM  W2
    IF b5 > $1F THEN MIX_IT
    GOTO  MORE_STUFF
NOISE:
    DEBUG  BELL
NOISE2:
    DEBUG  BELL
END:
```

Jameco Part number 143811

This routine makes use of the RAMPack B FIFO (first in first out) buffer. In buffer mode the RAMPack B stores data as it receives it. It also keeps track of the current address being written to. When a "read" is requested the RAMPack will send the user all data that has been been written to the RAM. In this routine the Basic STAMP 2 sends 9 bytes of data to the RAM buffer. It then reads back the data and checks to see if the data written matches the data read. The buffer mode does not use the sync byte to determine baud rates. The default baud rate is 2400 baud. If the buffer mode is going to be used the user should initialize the baud rate whenever power is applied to the RAMPack

```
    INPUT           15
    OUTPUT          14
    OUTPUT          13
    OUTPUT          12
    VALUE           VAR         BYTE

Initial values of variable registers

VALUE               = $DD
b4                  = $00
b5                  = $00
b15                 = $0A

START:
HIGH        14                  FM pin
HIGH        13                   read/write pin (low for write)
HIGH        12                  mode pin (low for buffer mode)
PAUSE       3000
                                initialize buffer for 19200 baud communication
SEROUT      14, 32, [$55,$04]
PAUSE       100

MORE STUFF:
LOW         13              enter "write" mode
LOW         12              enter "buffer" mode
                            send 9 bytes of data; 1 byte each 50ms
SEROUT      14, 32, 50,     [VALUE, $55, $99, $88, $32, $57, $69, $00, $10]
HIGH        12              exit "buffer" mode

PAUSE       2

HIGH        13              enter "read" mode
LOW         12              enter "buffer" mode
                            read in 9 bytes of data
SERIN       15, 32, 100     NOISE, [b15, b14, b13, b12, b11, b10, b9, b8, b7]
                            exit "buffer" mode
HIGH        12

DISPLAY:
    DEBUG  ISHEX2 b4, TAB, CR, CR

    if VALUE <> b15 then NOISE
    if b14 <> $55 then NOISE
    if b13 <> $99 then NOISE
    if b12 <> $88 then NOISE
    if b11 <> $32 then NOISE
    if b10 <> $57 then NOISE
    if b9 <> $69 then NOISE
    if b8 <> $00 then NOISE
    if b7 <> $10 then NOISE
```

```
Jameco Part number 143811
      VALUE = VALUE +1
MIX_IT:
RANDOM W2
      IF b4 > $1B THEN MIX_IT
      GOTO  MORE_STUFF
NOISE:
DEBUG         BELL
DEBUG         ISHEX2        b4, TAB
DEBUG         ISHEX2        b7, TAB, CR, CR
DEBUG         ISHEX2        VALUE, TAB
DEBUG         ISHEX2        b15, TAB
DEBUG         ISHEX2        b14, TAB
DEBUG         ISHEX2        b13, TAB, CR, CR
END:
```